CHAPTER FIVE
Construction and Right-of-Way Costs

INTRODUCTION

This chapter summarizes the estimated construction and right-of-way acquisition costs for the Washington Commerce Corridor. It also includes potential ranges of costs for several different alignment options, offers an estimate for the East-West connector costs, and explains the assumptions and reasoning behind these estimates.

This chapter is not a discussion of the feasibility of the corridor. It merely outlines the costs associated with the type of corridor outlined thus far in thus study (refer to *Chapter 2: Definition of Project Features*). It also provides part of the overall information needed to determine the feasibility of the corridor. Other factors will be discussed in different chapters of the study.

The costs shown in this document represent an estimate of the probable costs prepared in good faith and with reasonable care.[1] The estimates of order-of-magnitude probable project costs reflect the current level of planning and design decisions, and the range of potential costs for project elements for which the scope has been defined on only a conceptual basis. At this level of development, the estimates of project cost are illustrative in nature.

OVERALL METHODOLOGY

Corridor Broken Into "Costing" Segments

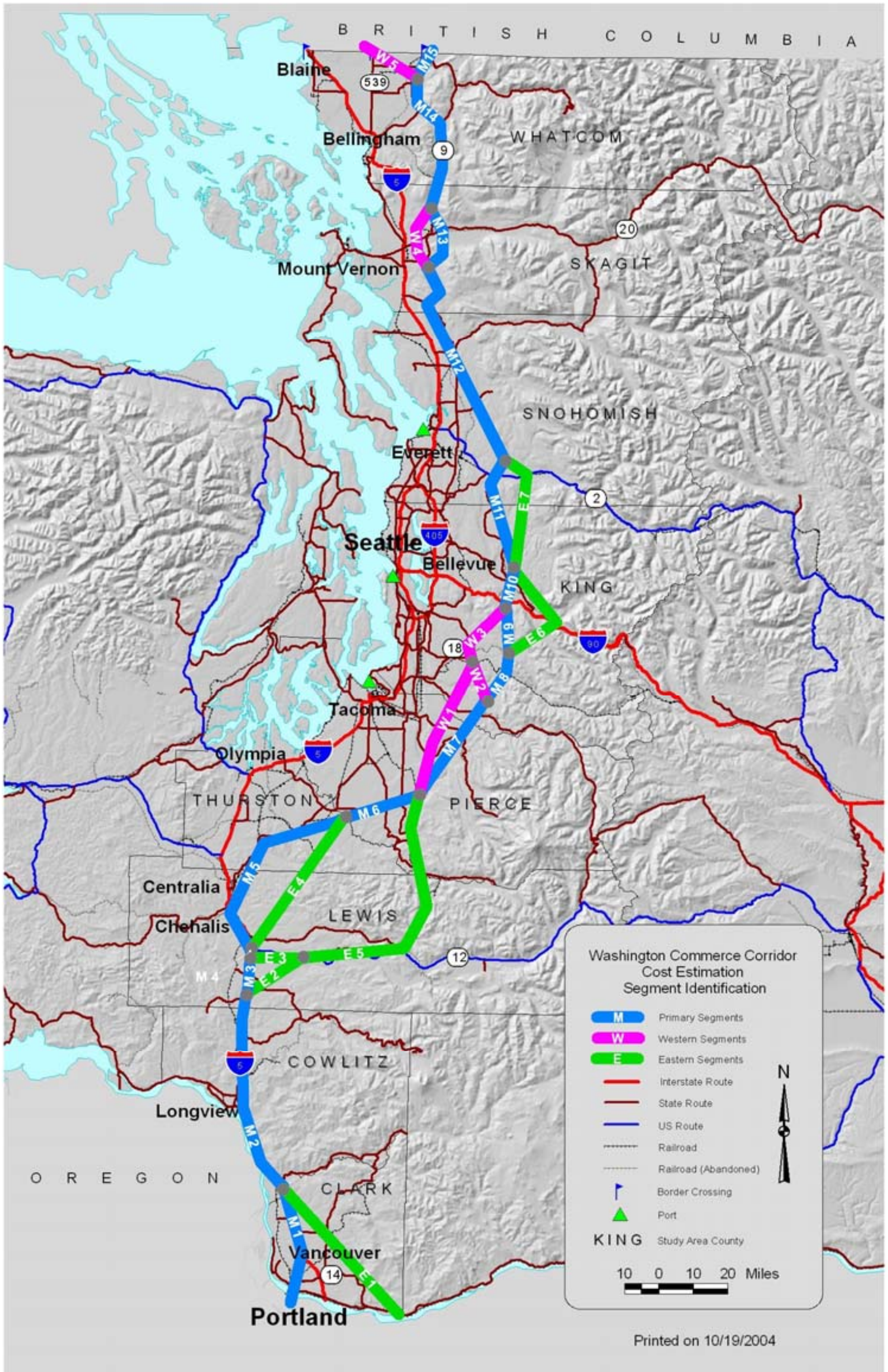
Given that the total study area incorporates some 2,297 square miles, it was deemed necessary to break the corridor into smaller, more manageable pieces to perform the costing analysis. In all, the corridor is divided into 27 smaller "costing" segments that range in size from 1.6 miles in length to 50 miles in length. Segments were defined by a combination of natural and human-made parameters. Every effort was made to divide segments at natural breaks or geographic boundaries, such as rivers, ecosystem boundaries, or geologic profile; as well as man made boundaries such as freeways or political boundaries. This method of dividing the corridor into smaller segments allows for:

1) Customizing cost estimates based on geography, terrain, land use, land values, construction techniques, etc; and,
2) Flexibility to develop a variety of alternative scenarios by mixing the combination of segments.

For purposes of this analysis, each segment was assigned a number, as is shown in Exhibit 5-1.

[1] The consultant team has no control over the costs of construction labor, materials, or equipment, nor over competitive bidding or negotiating methods and does not make a commitment or assume any duty to assure that bids or negotiated prices would not vary from the attached estimates.

Exhibit 5-1
Corridor is Divided into 27 Costing Segments



Corridor Super Segments

While breaking the corridor into smaller sections improves the cost estimates and allows for greater flexibility in defining the scenarios, they must be aggregated to allow clearer descriptions for purposes of this chapter. Therefore, much of the discussion in this report is based on a set of 5 "Super Segments". The super segments represent natural breaks to the corridor that relate to major east-west corridors. They are summarized in the table below.

Exhibit 5-2
Table Showing the Super Segments Along the Corridor

Super Segment	Costing Segments	Approx. Length in Miles
Vancouver WA to Chehalis	M01, M02, E01	59.6
Chehalis to I-90	E02, E03, E04, E05, M03, M04, M05, M06, M07, M08, M09, E06, W01, W02, W03	186.6
I-90 to SR 2	M10, M11, E07	31.6
SR 2 to SR 20	M12, M13, W04	54.5
SR 20 to Canada (Border)	M14, M15, W05	33.1

Definition of Alignment Alternatives

This chapter outlines costs estimates for three different scenarios:

- **Alternative 1 -** Incorporates all modes along the entire alignment;
- **Alternative 2 -** Uses all existing railroad infrastructure; and,
- **Alternative 3 -** Is an eastern route through Lewis County, by-passing part of the Mt. Baker Snoqualmie National Forest.

The three alternatives are described in full below.

Alternative 1 – This is a full-length, all-component alternative that includes truck roadway, railroad, natural gas pipeline, mixed-use trails, electric power lines, and petroleum pipeline along its entire alignment. This alternative represents the combination of costing segments options that provide the most direct route, over the flattest possible terrain, with the least possible river crossings, through the least possible urbanized areas.

1) **M01, M02, M03, M04**: The alignment begins near Portland, Oregon and runs almost due N along the I-5 corridor;
2) **M05**: Alignment veers NE off I-5 at Chehalis to a point roughly 25 miles south of Olympia in Thurston County, WA;
3) **M06**: The alignment turns eastward into Pierce County, traveling about 40 miles NE into Pierce County in order to bypass the heavily populated and congested Tacoma/Seattle Metropolitan corridor;

4) **M07, M08, M09, M10**: The alignment turns back towards due N as it enters and travels through King County at a distance roughly 30 miles E of the Seattle Metropolitan region, creating a broad arc around the metro region;
5) **E07, M12**: Roughly 10 miles past the King County/Snohomish County border, at approximately US Route 2, the alignment begins to point NW, coming closer to the coast and skirting the western edge of the Cascade mountain range;
6) **W04, M14, M15:** The alignment roughly follows SR 9 and the western edge of the Cascade foothills through Skagit and Whatcom counties and across the Canadian border, where it turns NE into British Columbia.

Alternative 2 – This alternative is very similar to Alternative 1, except that it utilizes as much existing railroad track and abandoned rail ROW as possible, resulting in partial separation of railroad from the other components. This occurs at:

1) **M09, M10, E06:** The modes briefly split up at a point roughly 10 miles N of the Pierce County/King County border.
   - **E06:** The railroad ROW heads sharply NE for 15 miles, before turning sharply NW to travel 15 miles back and rejoin the alignment, effectively making a "V" shaped derivation from the main alignment.
   - **M09, M10:** The truck roadway, mixed use path, electric power lines, gas and petroleum pipelines continue N, rejoining the railroad tracks (E6).
2) **E07:** All the components join together again and follow the same alignment as in Alignment 1, traveling N through to the Canadian border.

Alternative 3 - Like Alternative 1, Alternative 3 includes every corridor component (truck roadway, railroad, natural gas pipelines, mixed-use trails, power lines and petroleum pipelines) along its entire alignment; however it tests the impact of using tunneling as a method of avoiding terrain. As a result:

1) **Instead of M03, M04, M05 and M06, it takes E02, E05:** Five miles N of the Cowlitz/Lewis County border, the alignment turns sharply E to by-pass part of the Mt. Baker Snoqualmie National Forest, running roughly 40 miles along US Route 12 into the center of Lewis County. At this point the alignment turns N, traveling through Pierce County (E05 includes a significant amount of tunneling for the rail and highway components) and rejoins Alternative 1.

Exhibit 5-3
Table Summarizing the Costing Segments for Each Alternative

Super Segment	Alternative 1	Alternative 2	Alternative 3
Vancouver WA to Chehalis	M01, M02	M01, M02	M01, M02
Chehalis to I-90	M03, M04, M05, M06, M07, M08, M09*	M03, M04, M05, M06, M07, M08, M09, E06 (rail)*	E02, E05, M07, M08, M09*
I-90 to SR 2	M10, E07	M10, E07	M10, E07
SR 2 to SR 20	M12, W04	M12, W04	M12, W04
SR 20 to Canada (Border)	M14, M15	M14, M15	M14, M15

* These are the segments that come close to or involve the Cedar River Watershed

Exclusions from the Alternatives Analysis – Several costing segments were not included as part of any of the three alternatives.

1) **E1**: This segment was initially identified as a potential energy corridor cutting eastward away from the transportation corridor toward central Oregon. Since it only serves utilities, it was subsequently deemed as infeasible and is not included in the cost analysis.
2) **E3:** Plays the same role as E2 (connects to E5) but is less direct; therefore deemed as an unfeasible option and deemed as infeasible and is not included in the cost analysis.
3) **E4**: Includes 3-4 miles of tunnels, and tests the same tunneling cost hypothesis as E5 option although less expensive (discussion of costs points out the difference in cost between E4 and E5).
4) **W1**: This segment goes directly through the Muckelshoot tribal land. Moreover, this segment connects with W2 and W3 on the north (see below). No further cost analysis is conducted as part of the three alternatives.
5) **W2, W3**: These two segments run through the communities of Maple Valley, Black Diamond, and North Bend, areas that are largely urbanized. No further cost analysis is conducted as part of the three alternatives
6) **M11**: Runs through part of the Snoqualmie valley protected farmland. In addition, it skirts the Monroe urbanized area. These factors made E7 the more attractive and reasonable segment to evaluate.
7) **M13**: This segment would require tunneling to accommodate the railroad option. On the other hand, W4 runs parallel to M13 and already has existing railroad infrastructure. Therefore, W4 was evaluated instead of M13.
8) **W5**: Serves only utilities and was not evaluated as part of the scenarios.

COST ASSUMPTIONS AND RATIONALE

The overall methodology was to estimate the cost of purchasing the rights-of-way (ROW) needed for developing and constructing a multi-purpose transportation corridor as is outlined in *Chapter 2: Definition of Project Features*, as well as the construction costs associated with the types of uses outlined in that chapter. The costs estimates provided herein are on an order-of-magnitude basis and are intended for planning and policy level decisions. ROW costs are assigned on a per-acre basis, and vary by land use, etc. The construction costs are assigned on a per mile basis and vary based on type of construction, terrain, mode, etc.

This approach of using order-of-magnitude costs, while not as detailed as that used for detailed construction projects, is robust enough for this particular type of study.

Two overall types of costs are outlined herein;

- The costs associated with purchasing adequate **rights-of-way** needed for the corridor.
- The costs associated with **constructing** the corridor.

ROW Cost Assumptions

Right-of-way costs were developed for rural and urban settings. The assumed urban land value is \$4 million per acre and the assumed land value for rural land is \$75,000[2] per acre. These costs are applied to the mix of rural and urban acreage estimated for each costing segment. A baseline right-of-way width of 645 feet is assumed, consistent with the range of 506 to 710 feet developed in *Chapter 2*. In order to accommodate rolling terrain, right-of-way width for the highway and rail elements of the corridor were increased by 200 feet, and an additional 200 feet in mountainous terrain. These adjustments reflect the influence of cut and fill slopes with these terrain types, accounting for heights of fill or depths of cuts of up to 100 feet in mountainous terrain. No such right-of-way adjustments were made for the pipeline or power transmission modes.

Construction Cost Assumptions

The following section outlines the assumptions used for estimating the construction costs. Appendix 1 to this chapter outlines the per unit cost assumptions.

Types of Costs Included - The per-mile unit costs include the costs of surveying, engineering, inspection services, geotechnical investigations, environmental "best practices" in storm water treatment, and construction traffic control, but exclude highly variable costs such as wetland mitigation. The bridge, tunnel and causeway segments are intended to avoid critical environmental impacts and community concerns at several locations in the corridor.

Contingencies - A contingency figure equal to 20 percent of the construction cost is incorporated in the cost estimates to reflect uncertainties associated with unanticipated construction features and additional environmental mitigation.

Highway Cost Assumptions - The estimates of probable project cost for the highway elements of the corridor are based on "per lane-mile" and other gross unit costs developed from comparisons to other projects that involve construction of freeways in urban and rural environments. Unit costs vary according to rural/urban environments and level, rolling, or mountainous terrain types.

[2] Based on discussions with WSDOT, the default rural ROW cost assumptions are \$1 per sf (or \$43,560 per acre) for farmland and \$2 per sf (or \$87,120 per acre) for all other rural. Based on *Chapter 3*, 26.5% of the rural land is farmland; therefore, a weighted cost per acre of \$75,000 was used for this study.

Bridge crossings of rivers, streams, and local roads and streets were estimated separately and added to the on-grade segment costs. Where tunnel segments are included, a specific cost was developed for bored tunnels. The tunnel segments include two two-lane bores for each of the auto and truck highway facilities, consistent with the limitations of current tunneling technology. Railway tunnels consist of two bores, each accommodating one rail line and maintenance access. Lane-mile unit costs generally represent recent projects within Washington State, summarized in a January, 2003 WSDOT memorandum. Bridge unit costs also represent recent local experience. Tunnel costs were derived from recent East Coast and European experience. A summary of typical lane-mile costs is attached for reference.

Railroad Cost Assumptions - Railroad facility costs were based on centerline track miles, representing the construction costs of double-track Class I railroad. Bridge crossings, tunnels, and causeways were estimated separately and added to the on-grade segment costs. These data are based on recent Northwest railway projects.

Utility Cost Assumptions - Costs for construction of pipelines, power lines, and trails were estimated by centerline miles.

Toll Technologies - Costs for toll equipment and corridor management functions are added to the capital costs because they are not included in the representative existing per-mile construction costs. These include toll collection stations, camera systems, active traffic monitoring, variable message signing, and traffic management center. Costs associated with the telecommunications network for the corridor are assumed to be the responsibility of a leaseholder, and are not included in the ITS estimate. No costs are included for commercial vehicle tracking networks, or for additional security provisions pursuant to potential legislation.

Maintenance Costs[3] - Estimates of maintenance costs were prepared for the highway portions of the project, based on historic WSDOT statistics. Operations and maintenance costs for the remaining modes are typically supported by the facility owners or leaseholders in the private realm, and statistics are difficult to obtain due to the proprietary nature of the information. No estimate of operations and maintenance costs was performed for the railroad, pipeline or power transmission modes. In Washington State, maintenance costs for Interstate highways averaged about $4,300 per lane-mile in 1997, including both urban and rural facilities. Costs associated with toll collection and operation of the corridor are added to the routine maintenance costs, because these functions are not represented in today's WSDOT maintenance budgets. These costs typically are estimated at about $0.20 per trip for electronic toll transactions. Without firm activity forecasts, they are estimated on the basis of 100,000 daily trips (total for both auto and truck tollways), and translated to a lane-mile basis. Operations and maintenance costs derived in this way would total about $7,500 per lane mile of highway. A total of 10 maintenance facilities would be distributed over the length of the corridor to serve maintenance functions. No rest area maintenance costs are included.

East West Connector Costs - Estimates of costs to improve the infrastructure of the E-W connectors to the WCC were also prepared. (see appendix 15) The estimates were based on the assumption that there would only be one E-W connector per county along the length of the WCC.

[3] Maintenance costs were calculated for illustrative purposes only and are not included in the final capital cost estimates.

Estimates included various scenarios of probable necessary improvements to the modes of highway, utility pipeline, and railroad tracking. The costs are preliminary in nature and are not based on a detailed capacity analysis of the respective E-W corridors. They include the following costs:

- Whatcom County: New 2-lane arterial highway and single track rail
- Skagit County: Improvements to SR 20 and utility infrastructure
- Snohomish County: Improvements to SR 2 and utility infrastructure
- King County: Improvements to I-90
- Pierce County: Improvements to SR 410, new single-track rail connecting Orting to Tacoma, and utility infrastructure
- Thurston County: New 2-lane arterial and utility infrastructure

These costs are estimated on the anticipation that the development of the WCC will result in added capacity needed for the E-W corridors. Taken together, these costs would total an additional $1.2 billion dollars to the total cost of the WCC. Though preliminary in nature, it is evident that the costs for these connecting corridors are a significant cost which will affect the feasibility of the WCC corridor.

RESULTS OF COST ANALYSIS

Comparison across Scenarios

Based on our evaluation of probable project costs, the Washington Commerce Corridor could be implemented for between $42 billion and $50 billion[4]. The most cost effective approach is to use as much of the existing rail infrastructure as is available (Alternative 2), saving approximately $1 billion over the baseline option (Alternative 1) of $42.8 billion [5]. The most expensive option is to by-pass part of the Mt. Baker Snoqualmie National Forest, requiring a significant amount of tunneling and causing the cost to jump by $6.7 billion.

Exhibit 5-4
Cost Estimates by Alternative
(In 2003 Dollars)

Alternative	Description	Estimated Cost ($M)
1	All Modes Together	42,770
2	Use Existing Railroad Grade in Eastern King County	41,867
3	Eastern Route Through Lewis County	49,492

[4] All Costs are in 2003 dollars

[5] Note that, for Alternative 1, using a more direct route west of part of the Mt. Baker Snoqualmie National Forest (M05) as opposed to E05 will likely cut the overall cost for Alternative 1 to $38.8 billion. This is because of the significantly lower ROW costs associated with M05. While E05 costs $2.2 billion more to construct (6 miles of tunneling), M05 costs $4.5 billion more in ROW.

Comparing ROW Acquisition and Construction Costs

The ROW costs for Alternative 1 and Alternative 2 are both $17 billion, a figure that is approximately 40% of total costs for each alternative. Construction costs represent approximately 60% of total costs. Alternative 3, on the other hand, has considerably higher construction costs (associated with tunneling costs) but lower ROW acquisition costs (due to a larger share of rural ROW).

Exhibit 5-5
Construction Costs and ROW Costs

Estimated Cost (billions of 2003 dollars)

Item	Alternative 1	Alternative 2	Alternative 3
Construction	$25.5	$24.5	$34.9
Right-of-Way	$17.2	$17.4	$14.6
Total	**$42.8**	**$41.9**	**$49.5**

Comparing the Costs for Each Super Segment

It can be expected that total cost grows relative to segment length. The section with the highest cost is also the longest of the 5, the 186.6 mile "Chehalis to I-90". The shortest segment, "SR 20 to Canada", is 33.1 miles and has the lowest costs. It is also worth noting that there is very little variation between the three alternatives across the Super Segments, with the exception being the "Chehalis to I-90" segment where the Alternative 3 costs are $6.7 billion higher due to tunneling costs (see below).

Exhibit 5-6
Total Costs by Super Segment
(Millions of 2003 $)

Corridor Super Segment	Alternative		
	1	2	3
SR 20 to Canada	4,103	4,103	4,103
SR 2 to SR 20	4,719	4,719	4,719
I-90 to SR 2	4,449	4,335	4,449
Chehalis to I-90	14,480	13,862	19,641
Vancouver to Chehalis	10,895	10,895	10,895
Subtotal ($M)*	**38,646**	**37,914**	**43,808**

*Note: Excludes ITS and contingency costs.

ROW costs are somewhat consistent across each of the alternatives, except for a $3 billion drop in the "Chehalis to I-90" super segment for Alternative 3, largely due to a comparatively larger share in rural ROW. While rural ROW acreage for Alternatives 1 and 2 represents 80% of the ROW acreage needed, this figure jumps to 85% for Alternative 3.

Exhibit 5-7
ROW Acquisition Costs by Super Segment
(Millions of 2003 $)

Corridor Segment	Alternative 1	Alternative 2	Alternative 3
SR 20 to Canada	764	764	764
SR 2 to SR 20	2,146	2,146	2,146
I-90 to SR 2	2,247	2,184	2,247
Chehalis to I-90	6,956	7,140	4,312
Vancouver to Chehalis	5,126	5,126	5,126
Total ($M)	**17,239**	**17,359**	**14,595**

Isolating construction costs reveals a similar pattern as ROW costs. As is shown in Exhibit 5-8, the construction costs of each Super Segment stay roughly similar between the three alternatives. As before, the one exception to this rule is the "Chehalis to I-90" Super Segment - Alternative 3 is almost $9 billion more due to costs associated with tunneling.

Exhibit 5-8
Construction Costs Across Super Segments
(Millions of 2003 $)

Corridor Segment	Alternative 1	Alternative 2	Alternative 3
SR 20 to Canada	3,162	3,162	3,162
SR 2 to SR 20	2,395	2,395	2,395
I-90 to SR 2	1,771	1,721	1,771
Chehalis to I-90	7,214	6,412	15,019
Vancouver to Chehalis	5,688	5,688	5,688
Total ($M)	**20,230**	**19,378**	**28,035**

Impact of Structural Costs on the Overall Costs

"At grade" construction refers to construction that can proceed without the use of structures to separate the facilities from the natural grade of the ground. "Structured" implies that infrastructure such as grade separations, bridges, tunnels, and causeways are necessary prior to proceeding with construction. Due to the nature of the terrain along the overall corridor, at least half of all construction costs are related to structures, and up to 65% for Alternative 3. Structured construction is typically considerably higher cost than at grade construction.

Exhibit 5-9
At Grade Vs. Structured Percentages
(% Share of Construction Cost)

Type	Alternative 1	Alternative 2	Alternative 3
At-Grade	47%	50%	35%
Structured	53%	50%	65%

Comparison Across Modal Components

The roadway components contribute 70% of the total costs of the corridor (35% each for the truck and general purpose components). Rail contributes between 10% and 16% of the total cost, depending on the alternative. For example, Alternative 2 utilizes existing rail infrastructure and is the most favorable while Alternative 3 requires considerable tunneling and is hence the least favorable. The energy (power and pipeline) component contributes between 10% and 14%, with Alternative 3 being the most favorable due to a larger proportionate share of rural ROW. Trails contribute the lowest share of the cost with approximately 3% of the total corridor cost.

Exhibit 5-10
Costs by Mode
(Millions of 2003 $)

Mode	Alternative 1	Alternative 2	Alternative 3
Truck	13,636	13,734	15,593
Railroad	4,962	3,939	7,136
General Purpose	13,636	13,734	15,593
Trails	1,236	1,255	1,024
Power	3,064	3,108	2,588
Pipeline	2,113	2,146	1,872
Subtotal ($M)*	**38,646**	**37,914**	**43,808**

*Note: Excludes ITS and contingency costs.

When comparing the various modal contributions toward ROW and construction costs, there are some important differences.

- While the roadway components contribute a 35% share each (truck and general purpose) towards overall costs, their relative contribution toward construction costs are greater (40%) than towards ROW (30%).
- The same effect exists for rail – a 12-20% relative share toward construction and 8-10% relative share toward ROW.
- The energy components have an opposite effect – while they only contribute 2-4% toward construction costs, they contribute 25% toward ROW costs.

- The trail component contributes less than 1% towards construction costs but 7% towards ROW costs.

These distinctions have an impact on the various roles of the private sector versus the public sector involvement. For example, if government was to assume the cost of the right-of-way and recoup the facilities costs through a user fee, the transportation components would present the greatest share return due to their relatively higher contribution toward construction costs which are recouped. On the other hand, the energy components present the least opportunity of recouping the costs. This is unless, of course, the government intends to recoup 100% of the development costs (ROW and construction) from the different modal components. This is dependent on the ability of the various modal components to produce adequate revenue streams to recoup 100% of the development costs.

Exhibit 5-11
Modal Contribution to Type of Cost (ROW vs Construction)
(Millions of 2003 $)

Alternative 1	Truck	Railroad	GP	Trails	Power	Pipeline
Construction Cost	8,584	3,321	8,584	91	421	406
Share of Const Cost	40%	16%	40%	0%	2%	2%
ROW Cost	5,052	1,641	5,052	1,145	2,642	1,707
Share of ROW Cost	29%	10%	29%	7%	15%	10%
Subtotal (Const & ROW)	13,636	4,962	13,636	1,236	3,064	2,113
Share of Subtotal	35%	13%	35%	3%	8%	5%
Alternative 2	**Truck**	**Railroad**	**GP**	**Trails**	**Power**	**Pipeline**
Construction Cost	8,584	2,468	8,584	91	421	406
Share of Const Cost	42%	12%	42%	0%	2%	2%
ROW Cost	5,149	1,470	5,149	1,164	2,686	1,740
Share of ROW Cost	30%	8%	30%	7%	15%	10%
Subtotal (Const & ROW)	13,734	3,939	13,734	1,255	3,108	2,146
Share of Subtotal	36%	10%	36%	3%	8%	6%
Alternative 3	**Truck**	**Railroad**	**GP**	**Trails**	**Power**	**Pipeline**
Construction Cost	11,255	5,790	11,255	85	422	406
Share of Const Cost	39%	20%	39%	0%	1%	1%
ROW Cost	4,339	1,346	4,339	939	2,167	1,466
Share of ROW Cost	30%	9%	30%	6%	15%	10%
Subtotal (Const & ROW)	15,593	7,136	15,593	1,024	2,588	1,872
Share of Subtotal	36%	16%	36%	2%	6%	4%

Detailed Cost Comparison Tables

Exhibits 5-12, 5-13, and 5-14 are all-inclusive cost estimates for each of the three alternatives. They include segment construction cost by mode, construction cost by segment, and ROW costs per segment. In addition, they include an ITS capital cost, a 20% contingency cost and an estimate for annual route maintenance costs. The Appendices to this report contain detailed tables to support the cost estimates produced herein.

Exhibit 5-12
Alternative 1 Cost Estimate by Mode and Segment
(Millions of 2003 $)

Corridor Segment	Segment Construction Cost by Mode ($M)						Const. Cost ($M)	ROW Cost ($M)	Seg. Cost ($M)
	Truck	Railroad	GP	Trails	Power	Pipeline			
SR 20 to Canada	1,196	825	1,196	10	50	62	3,339	764	4,103
SR 2 to SR 20	1,053	286	1,053	20	82	79	2,573	2,146	4,719
I-90 to SR 2	952	183	952	11	47	56	2,202	2,247	4,449
Chehalis to I-90	2,854	1,490	2,854	36	153	137	7,524	6,956	14,480
Vancouver to Chehalis	2,529	537	2,529	14	89	72	5,769	5,126	10,895
Subtotal ($M)	8,584	3,321	8,584	91	421	406	21,407	17,239	
ITS Capital Cost ($M):							78		
Const. Contingency (20%):							4,046		
Construction Cost ($M)							25,531		
Total Route Capital Cost ($M):									**42,770**
Annual Maintenance ($M):									16.2

Exhibit 5-13
Alternative 2 Cost Estimate by Mode and Segment
(Millions of 2003 $)

Corridor Segment	Segment Construction Cost by Mode ($M)						Const. Cost ($M)	ROW Cost ($M)	Seg. Cost ($M)
	Truck	Railroad	GP	Trails	Power	Pipeline			
SR 20 to Canada	1,196	825	1,196	10	50	62	3,339	764	4,103
SR 2 to SR 20	1,053	286	1,053	20	82	79	2,573	2,146	4,719
I-90 to SR 2	952	132	952	11	47	56	2,152	2,184	4,335
Chehalis to I-90	2,854	688	2,854	36	153	137	6,722	7,140	13,862
Vancouver to Chehalis	2,529	537	2,529	14	89	72	5,769	5,126	10,895
Subtotal ($M)	8,584	2,468	8,584	91	421	406	20,555	17,359	
ITS Capital Cost ($M):							78		
Const. Contingency (20%):							3,876		
Construction Cost ($M)							24,508		
Total Route Capital Cost ($M):									**41,867**
Annual Maintenance ($M):									16.2

Exhibit 5-14
Alternative 3 Cost Estimate by Mode and Segment
(Millions of 2003 $)

Corridor Segment	Segment Construction Cost by Mode ($M)						Const. Cost ($M)	ROW Cost ($M)	Seg. Cost ($M)
	Truck	Railroad	GP	Trails	Power	Pipeline			
SR 20 to Canada	1,196	825	1,196	10	50	62	3,339	764	4,103
SR 2 to SR 20	1,053	286	1,053	20	82	79	2,573	2,146	4,719
I-90 to SR 2	952	183	952	11	47	56	2,202	2,247	4,449
Chehalis to I-90	5,525	3,960	5,525	30	153	137	15,329	4,312	19,641
Vancouver to Chehalis	2,529	537	2,529	14	89	72	5,769	5,126	10,895
Subtotal ($M)	11,255	5,790	11,255	85	422	406	29,213	14,595	
ITS Capital Cost ($M):							78		
Const. Contingency (20%):							5,607		
Construction Cost ($M)							34,897		
Total Route Capital Cost ($M):									**49,492**
Annual Maintenance ($M):									15.3

CONCLUSION

Based on our evaluation of probable project costs, the Washington Commerce Corridor could be implemented for between $42 billion and $50 billion.

Corridor construction would require between $20 - $29 billion dollars between the Canadian and Oregon borders, a distance of about 280 miles. This includes $9 - $11 billion for each of the auto and truck toll highways, $2.5 - $5.8 billion for the rail facilities, and about $900 million for the remaining pipeline, power transmission lines, and trails proposed for the corridor.

Alternative 1 - The construction cost for the baseline alignment includes tunnel segments at two locations in the corridor, for the highway and rail modes only. Near Deming, tunnel lengths of 3.5 miles would be required for the highway modes, and 3.8 miles for the rail mode. South of Snoqualmie, highway tunnels of 3.8 miles, and rail tunnels of 5.8 miles are included. Right-of-way costs for the project total about $17.2 billion for land acquisition for the baseline alternative. A total of about 16,800 acres of rural land and 4,000 acres of urban land would be required.

Alternative 2 - Placement of the rail facilities at grade using the alignment option near North Bend could eliminate the need for rail tunnels south of Snoqualmie, at a potential savings in construction cost of about $1.0 billion. This savings is partially offset by additional right-of-way costs of approximately $0.1 billion, so that Alternative 2 would produce a net savings of about $0.9 billion, compared to the baseline alignment.

Alternative 3 - Inclusion of optional segments with additional tunnel mileage could be expected to produce a maximum construction cost. An alignment alternative following the SR 7 and SR 12 corridors would include about 16 miles of tunnel for highway and rail modes (total of 6 bores). An illustrative estimate for this alignment is shown as Alternative 3, with a total cost of almost $50 billion. The construction cost would rise by $9billion with the additional tunnels, and right-of-way costs would drop by $2.6 billion, to produce a net increase of $6.8 billion relative to the baseline alignment.

Maintenance - Annual operating and maintenance cost for the highway facilities are estimated at $15 to $18 million dollars, with the higher figures representing those alignments with significant tunnel segments. Estimated maintenance cost for the baseline alignment would be about $16 million annually.

Financial Perspective – The total annual transportation capital budget for WSDOT (new projects and maintenance of existing facilities) for entire state averages between $600 and $900 million dollars. The annual debt service on a 30 year bond to finance the completion of the entire corridor ($40 billion), if it were to be completed, would likely amount to an estimated $2.75 billion per year (this estimate may vary depending on actual interest rate and financing terms). In other words, the annual debt service payments on the fully developed WCC, as is defined in *Chapter 2: Definition of Project Features* would be 3-5 times the total current levels of annual capital expenditures on statewide transportation. Based on this, the costs associated with developing the corridor in its entirety present a virtually impossible financial challenge for WSDOT and for the state as a whole. It would not be possible to implement without generating additional revenue from the users of the corridor, or pursuing a less comprehensive approach.